

Routine Reporting of Estimated GFR

PLEASE NOTE The National Kidney Disease Education Program (NKDEP) recommends that clinical laboratories use the current MDRD equation without changing the calibration of serum creatinine assays. Re-calibration of serum creatinine to be traceable to isotope dilution mass spectrometry reference methods should be introduced at the same time as a revised MDRD equation that has coefficients appropriate for use with a zero-biased creatinine method. The revised MDRD equation is expected in fall 2005.

In adults, age 18 years and older, the MDRD equation has been shown to be the best for estimating glomerular filtration rate (GFR) from serum creatinine.^{1,2} Use of the MDRD equation provides the best means currently available for providing a more appropriate use of serum creatinine as a measure of renal function by estimating the GFR. The NKDEP recommends that estimated GFR be reported along with serum creatinine results.

MDRD Equation

GFR (mL/min/1.73 m²) = 186 x (S_{cr})^{-1.154} x (Age)^{-0.203} x (0.742 if female) x (1.210 if African American) (conventional units)

The equation requires **4 variables**:

- Serum, or plasma, creatinine (S_{cr}) in mg/dL
- Age in years (18 years or older)
- Sex
- Race (African American or not)

SI units when serum, or plasma, creatinine (S_{cr}) is in μmol/L:

GFR (mL/min/1.73 m²) = 186 x (S_{cr}/88.4)^{-1.154} x (Age)^{-0.203} x (0.742 if female) x (1.210 if African American)

Reporting Values

Since a patient's race is often not available to clinical laboratories, and because mixed ethnicity can make it difficult to classify a patient's race, a general recommendation is to report estimated GFR values for both African Americans and non-African Americans (see Sample Reports). Note that the equation does not require weight or height because the result is reported normalized to 1.73 m² body surface area, which is an accepted average adult body surface area.

The NKDEP recommends reporting serum creatinine values in mg/dL to two decimal places (e.g., 0.95 mg/dL); and reporting values in μmol/L to the nearest whole number (e.g., 84 μmol/L). This reporting recommendation will reduce rounding errors that may contribute to imprecision in the estimated GFR value.

The NKDEP presently recommends reporting estimated GFR values **above 60 mL/min/1.73 m²** simply as ">60 mL/min/1.73 m²", not as an exact number. For values **60 mL/min/1.73 m² and below**, the report should give the numerical estimate (e.g., "32 mL/min/1.73 m²").

There are 3 reasons for this recommendation:

1. The equation has been most extensively evaluated in people with some degree of renal insufficiency.
2. Inter-laboratory differences in calibration of the creatinine assay, and the imprecision of the assay, have their greatest impact in the near-normal range and therefore lead to greater inaccuracies.³
3. Quantification of GFR below 60 mL/min/1.73 m² has more clinical implications than above that level.

The NKDEP recommends reporting the estimated GFR value for individuals over age 70 because the GFR is a diagnostic tool and, while it has not been validated specifically in older adults, there is no strong evidence to doubt that it is a clinically appropriate tool.

Sample Reports

Note: If your printing system does not allow for superscripts, we recommend reporting mL/min/1.73 “square meters” or “m².”

Sample report for a 63-year old woman

Creatinine = 1.82 mg/dL

GFR_{est} if African American = 36 mL/min/1.73 m²

GFR_{est} if non-African American = 30 mL/min/1.73 m²

Sample report for a 62-year old man

Creatinine = 1.35 mg/dL

GFR_{est} if African American = >60 mL/min/1.73 m²

GFR_{est} if non-African American = 57 mL/min/1.73 m²

Sample report for a 55-year old man

Creatinine = 1.07 mg/dL

GFR_{est} if African American = >60 mL/min/1.73 m²

GFR_{est} if non-African American = >60 mL/min/1.73 m²

The decision limits for GFR_{est} can be indicated as >60 mL/min/1.73 m² because numeric values are not provided at higher values.

Next Steps

Use of the MDRD equation provides the best means currently available for providing a more appropriate use of serum creatinine as a measure of renal function by estimating the GFR. Efforts are underway, however, to validate the equation in more diverse populations including Hispanics, people with diabetes, and people with normal renal function.

The Laboratory Working Group of the NKDEP is addressing the inter-laboratory variation in creatinine assay calibration. The group is developing a program to standardize and improve serum creatinine measurements, which will enable accurate estimations of GFR in the range greater than 60 mL/min/1.73 m² and in children by all clinical laboratories. Updates on this process will be posted on the NKDEP website (www.nkdep.nih.gov/labprofessionals.htm).

Contact Info

For assistance, please contact Elisa Gladstone (Tel: **301-435-8116**; Email: elisa.gladstone@nih.gov) with the National Kidney Disease Education Program.

References

- 1) Levey AS, Coresh J, Balk E, et al. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. *Ann Intern Med* 2003; 139:137-47.
- 2) Manjunath G, Sarnak MJ, Levey AS. Prediction equations to estimate glomerular filtration rate: an update. *Curr Opin Nephrol Hypertens* 2001; 10:785-92.
- 3) Coresh J, Astor BC, McQuillan G, et al. Calibration and random variation of the serum creatinine assay as critical elements of using equations to estimate glomerular filtration rate. *Am J Kidney Dis* 2002; 39:920-9.